

SEQUENCE LISTING

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<120> METHODS AND COMPOSITIONS FOR PRODUCTION OF FLAVONOID
AND ISOFLAVONOID NUTRACEUTICALS

<130> NBLE:007US

<140> UNKNOWN

<141> 2003-09-10

<150> 60/409,447

<151> 2002-09-10

<160> 14

<170> PatentIn Ver. 2.1

<210> 1

<211> 1824

<212> DNA

<213> Soybean

<400> 1

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<212> PRT

<213> Soybean

<400> 2

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          20                      25                      30

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Pro Asn Pro Pro Ser Pro Lys Pro Arg Leu Pro Phe Ile Gly His Leu
          35                      40                      45

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His Leu Leu Lys Asp Lys Leu Leu His Tyr Ala Leu Ile Asp Leu Ser
          50                      55                      60

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Lys Lys His Gly Pro Leu Phe Ser Leu Tyr Phe Gly Ser Met Pro Thr
          65                      70                      75                      80

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Val Val Ala Ser Thr Pro Glu Leu Phe Lys Leu Phe Leu Gln Thr His
          85                      90                      95

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Glu Ala Thr Ser Phe Asn Thr Arg Phe Gln Thr Ser Ala Ile Arg Arg
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Leu Thr Tyr Asp Ser Ser Val Ala Met Val Pro Phe Gly Pro Tyr Trp
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Lys Phe Val Arg Lys Leu Ile Met Asn Asp Leu Pro Asn Ala Thr Thr
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Val Asn Lys Leu Arg Pro Leu Arg Thr Gln Gln Thr Arg Lys Phe Leu
          145                      150                      155                      160

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Glu	Glu	Leu	Leu	Lys	Trp	Thr	Asn	Ser	Thr	Ile	Ser	Met	Met	Met	Leu	180	185	190	
Gly	Glu	Ala	Glu	Glu	Ile	Arg	Asp	Ile	Ala	Arg	Glu	Val	Leu	Lys	Ile	195	200	205	
Phe	Gly	Glu	Tyr	Ser	Leu	Thr	Asp	Phe	Ile	Trp	Pro	Leu	Lys	His	Leu	210	215	220	
Lys	Val	Gly	Lys	Tyr	Glu	Lys	Arg	Ile	Asp	Asp	Ile	Leu	Asn	Lys	Phe	225	230	235	240
Asp	Pro	Val	Val	Glu	Arg	Val	Ile	Lys	Lys	Arg	Arg	Glu	Ile	Val	Arg	245	250	255	
Arg	Arg	Lys	Asn	Gly	Glu	Val	Val	Glu	Gly	Glu	Val	Ser	Gly	Val	Phe	260	265	270	
Leu	Asp	Thr	Leu	Leu	Glu	Phe	Ala	Glu	Asp	Glu	Thr	Met	Glu	Ile	Lys	275	280	285	
Ile	Thr	Lys	Asp	His	Ile	Glu	Gly	Leu	Val	Val	Asp	Phe	Phe	Ser	Ala	290	295	300	
Gly	Thr	Asp	Ser	Thr	Ala	Val	Ala	Thr	Glu	Trp	Ala	Leu	Ala	Glu	Leu	305	310	315	320
Ile	Asn	Asn	Pro	Lys	Val	Leu	Glu	Lys	Ala	Arg	Glu	Glu	Val	Tyr	Ser	325	330	335	
Val	Val	Gly	Lys	Asp	Arg	Leu	Val	Asp	Glu	Val	Asp	Thr	Gln	Asn	Leu	340	345	350	
Pro	Tyr	Ile	Arg	Ala	Ile	Val	Lys	Glu	Thr	Phe	Arg	Met	His	Pro	Pro	355	360	365	
Leu	Pro	Val	Val	Lys	Arg	Lys	Cys	Thr	Glu	Glu	Cys	Glu	Ile	Asn	Gly	370	375	380	
Tyr	Val	Ile	Pro	Glu	Gly	Ala	Leu	Ile	Leu	Phe	Asn	Val	Trp	Gln	Val	385	390	395	400
Gly	Arg	Asp	Pro	Lys	Tyr	Trp	Asp	Arg	Pro	Ser	Glu	Phe	Arg	Pro	Glu	405	410	415	

Arg Phe Leu Glu Thr Gly Ala Glu Gly Glu Ala Gly Pro Leu Asp Leu
420 425 430

Arg Gly Gln His Phe Gln Leu Leu Pro Phe Gly Ser Gly Arg Arg Met
435 440 445

Cys Pro Gly Val Asn Leu Ala Thr Ser Gly Met Ala Thr Leu Leu Ala
450 455 460

Ser Leu Ile Gln Cys Phe Asp Leu Gln Val Leu Gly Pro Gln Gly Gln
465 470 475 480

Ile Leu Lys Gly Gly Asp Ala Lys Val Ser Met Glu Glu Arg Ala Gly
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Leu Thr Val Pro Arg Ala His Ser Leu Val Cys Val Pro Leu Ala Arg
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Ile Gly Val Ala Ser Lys Leu Leu Ser
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<210> 3

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<212> DNA

<213> Medicago sativa

<220>

<221> CDS

<222> (41)..(709)

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Thr Ala Ile Thr Val Glu Asn Leu Glu Tyr Pro Ala Val Val Thr Ser
10 15 20

ccg gtc acc ggc aaa tca tat ttc ctc ggt ggc gct ggg gag aga gga 151
Pro Val Thr Gly Lys Ser Tyr Phe Leu Gly Gly Ala Gly Glu Arg Gly
25 30 35

ttg acc att gaa gga aac ttc atc aag ttc act gcc ata ggt gtt tat 199
Leu Thr Ile Glu Gly Asn Phe Ile Lys Phe Thr Ala Ile Gly Val Tyr
40 45 50

ttg gaa gat ata gca gtg gct tca cta gct gcc aaa tgg aag ggt aaa	247
Leu Glu Asp Ile Ala Val Ala Ser Leu Ala Ala Lys Trp Lys Gly Lys	
55 60 65	
tca tct gaa gag tta ctt gag acc ctt gac ttt tac aga gac atc atc	295
Ser Ser Glu Glu Leu Leu Glu Thr Leu Asp Phe Tyr Arg Asp Ile Ile	
70 75 80 85	
tca ggt ccc ttt gaa aag tta att aga ggg tca aag att agg gaa ttg	343
Ser Gly Pro Phe Glu Lys Leu Ile Arg Gly Ser Lys Ile Arg Glu Leu	
90 95 100	
agt ggt cct gag tac tca agg aag gtt atg gag aac tgt gtg gca cac	391
Ser Gly Pro Glu Tyr Ser Arg Lys Val Met Glu Asn Cys Val Ala His	
105 110 115	
ttg aaa tca gtt gga act tat gga gat gca gaa gct gaa gct atg caa	439
Leu Lys Ser Val Gly Thr Tyr Gly Asp Ala Glu Ala Glu Ala Met Gln	
120 125 130	
aaa ttt gct gaa gct ttc aag cct gtt aat ttt cca cct ggt gcc tct	487
Lys Phe Ala Glu Ala Phe Lys Pro Val Asn Phe Pro Pro Gly Ala Ser	
135 140 145	
gtt ttc tac agg caa tca cct gat gga ata tta ggg ctt agt ttc tct	535
Val Phe Tyr Arg Gln Ser Pro Asp Gly Ile Leu Gly Leu Ser Phe Ser	
150 155 160 165	
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Pro Asp Thr Ser Ile Pro Glu Lys Glu Ala Ala Leu Ile Glu Asn Lys	
170 175 180	
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Ala Val Ser Ser Ala Val Leu Glu Thr Met Ile Gly Glu His Ala Val	
185 190 195	
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Ser Pro Asp Leu Lys Arg Cys Leu Ala Ala Arg Leu Pro Ala Leu Leu	
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Asn Glu Gly Ala Phe Lys Ile Gly Asn	
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			20					25					30		
Ala	Gly	Glu	Arg	Gly	Leu	Thr	Ile	Glu	Gly	Asn	Phe	Ile	Lys	Phe	Thr
			35				40					45			
Ala	Ile	Gly	Val	Tyr	Leu	Glu	Asp	Ile	Ala	Val	Ala	Ser	Leu	Ala	Ala
	50					55				60					
Lys	Trp	Lys	Gly	Lys	Ser	Ser	Glu	Glu	Leu	Leu	Glu	Thr	Leu	Asp	Phe
65					70				75					80	
Tyr	Arg	Asp	Ile	Ile	Ser	Gly	Pro	Phe	Glu	Lys	Leu	Ile	Arg	Gly	Ser
					85				90					95	
Lys	Ile	Arg	Glu	Leu	Ser	Gly	Pro	Glu	Tyr	Ser	Arg	Lys	Val	Met	Glu
			100				105					110			
Asn	Cys	Val	Ala	His	Leu	Lys	Ser	Val	Gly	Thr	Tyr	Gly	Asp	Ala	Glu
		115					120					125			
Ala	Glu	Ala	Met	Gln	Lys	Phe	Ala	Glu	Ala	Phe	Lys	Pro	Val	Asn	Phe
	130					135					140				
Pro	Pro	Gly	Ala	Ser	Val	Phe	Tyr	Arg	Gln	Ser	Pro	Asp	Gly	Ile	Leu
145					150					155				160	
Gly	Leu	Ser	Phe	Ser	Pro	Asp	Thr	Ser	Ile	Pro	Glu	Lys	Glu	Ala	Ala
			165					170					175		
Leu	Ile	Glu	Asn	Lys	Ala	Val	Ser	Ser	Ala	Val	Leu	Glu	Thr	Met	Ile
			180				185					190			
Gly	Glu	His	Ala	Val	Ser	Pro	Asp	Leu	Lys	Arg	Cys	Leu	Ala	Ala	Arg
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<212> DNA

<213> Medicago sativa

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tagtatgaaa tgaagatct tgctttctac tcttgacta tttctgtgat agataatgtt 780
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      Met Val Ser Val Ser Glu Ile Arg Lys Ala Gln Arg Ala Glu
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ggc cct gca acc att ttg gcc att ggc act gca aat cca gca aat tgt      156
Gly Pro Ala Thr Ile Leu Ala Ile Gly Thr Ala Asn Pro Ala Asn Cys
  15               20               25               30

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gtt gaa caa agt aca tat cct gat ttt tac ttt aaa atc aca aat agc      204
Val Glu Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser
           35               40               45

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gag cac aag act gaa ctc aaa gag aaa ttc caa cgc atg tgt gat aaa      252
Glu His Lys Thr Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys
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tct atg atc aag agg aga tac atg tac cta aca gag gag att ttg aaa      300
Ser Met Ile Lys Arg Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys
           65               70               75

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gag aat cct agt gtt tgt gaa tat atg gca cct tca ttg gat gcc agg	348
Glu Asn Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg	
80 85 90	
caa gac atg gtg gtg gta gag gta cct aga cta ggg aag gag gct gca	396
Gln Asp Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala	
95 100 105 110	
gtg aag gct ata aaa gaa tgg ggt caa cca aag tca aag att act cac	444
Val Lys Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His	
115 120 125	
tta att gtt tgc act aca agt ggt gta gac atg cct gga gct gat tac	492
Leu Ile Val Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr	
130 135 140	
caa ctc aca aaa ctc ttg ggt ctt cgc cca tat gtg aaa agg tat atg	540
Gln Leu Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met	
145 150 155	
atg tac caa caa ggt tgc ttt gca gga ggc acg gtg ctt cgt ttg gct	588
Met Tyr Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala	
160 165 170	
aaa gat ttg gct gag aac aac aaa ggt gcc cgt gta ttg gtt gtt tgt	636
Lys Asp Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys	
175 180 185 190	
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Ser Glu Val Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu	
195 200 205	
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Asp Ser Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Ala Leu	
210 215 220	
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Ile Val Gly Ser Asp Pro Val Pro Glu Ile Glu Lys Pro Ile Phe Glu	
225 230 235	
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Met Val Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile	
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Asp Gly His Leu Arg Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp	
255 260 265 270	

gtt cct ggg att gtt tca aag aac att gat aaa gca tta gtt gaa gct 924
 Val Pro Gly Ile Val Ser Lys Asn Ile Asp Lys Ala Leu Val Glu Ala
 275 280 285

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 Phe Gln Pro Leu Gly Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala
 290 295 300

cac cct ggt ggc cct gca att tta gat caa gta gag caa aag tta gcc 1020
 His Pro Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Gln Lys Leu Ala
 305 310 315

ttg aag cct gaa aag atg aga gcc act aga gaa gtg ctt agt gaa tat 1068
 Leu Lys Pro Glu Lys Met Arg Ala Thr Arg Glu Val Leu Ser Glu Tyr
 320 325 330

gga aat atg tca agt gca tgt gtt ttg ttt atc tta gat gaa atg aga 1116
 Gly Asn Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg
 335 340 345 350

aag aaa tca act caa gat gga ctg aag aca aca gga gaa gga ctt gaa 1164
 Lys Lys Ser Thr Gln Asp Gly Leu Lys Thr Thr Gly Glu Gly Leu Glu
 355 360 365

tgg ggt gtg tta ttt ggc ttt gga cca gga ctt acc ata gaa act gtt 1212
 Trp Gly Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Ile Glu Thr Val
 370 375 380

gtt ttg cgc agt gtc gct ata tga aatgcttaat tattttattt ttatttatca 1266
 Val Leu Arg Ser Val Ala Ile
 385 390

ctttcaaatt tgcttgattt ttatgtaagg atgaaaaact cgtctacagt tcaacattta 1326

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<211> 389

<212> PRT

<213> Medicago sativa

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 Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His

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<212> DNA
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<222> (106)..(1275)

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Met Val Ser Val

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tct gaa att cgt cag gct caa agg gca gaa ggc cct gca acc atc atg 165
Ser Glu Ile Arg Gln Ala Gln Arg Ala Glu Gly Pro Ala Thr Ile Met
5 10 15 20

gcc att ggc act gca aat cca tcc aac tgt gtt gaa caa agc aca tat 213
Ala Ile Gly Thr Ala Asn Pro Ser Asn Cys Val Glu Gln Ser Thr Tyr
25 30 35

cct gat ttc tac ttc aaa atc aca aac agt gag cac aaa gtt gaa ctc 261
Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His Lys Val Glu Leu
40 45 50

aaa gag aaa ttt caa cgc atg tgt gat aaa tcc atg atc aag agg aga 309
Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met Ile Lys Arg Arg
55 60 65

tac atg tat ctt acc gaa gag att ttg aaa gaa aat cca agt gta tgt 357
Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn Pro Ser Val Cys
70 75 80

gaa tac atg gca cct tca ttg gat gct agg cag gac atg gtg gtg gta 405
Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp Met Val Val Val
85 90 95 100

gag gta cct aga ctt gga aag gag gct gca gtg aag gct ata aaa gaa 453
Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys Ala Ile Lys Glu
105 110 115

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Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile Phe Cys Thr Thr
120 125 130

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Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu Thr Lys Leu Leu	
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Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr Gln Gln Gly Cys	
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Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp Leu Ala Glu Asn	
165 170 175 180	
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Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu Val Thr Ala Val	
185 190 195	
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Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser Leu Val Gly Gln	
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Ala Leu Phe Gly Asp Gly Ala Ala Ala Leu Ile Val Gly Ser Asp Pro	
215 220 225	
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Ile Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val Trp Thr Ala Gln	
230 235 240	
aca att gct cca gac agt gaa gga gcc att gat ggt cac ctt gtc gaa	885
Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly His Leu Val Glu	
245 250 255 260	
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Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro Gly Ile Val Ser	
265 270 275	
aag aac att gat aaa gca ttg att gag gct ttc caa cca tta aac atc	981
Lys Asn Ile Asp Lys Ala Leu Ile Glu Ala Phe Gln Pro Leu Asn Ile	
280 285 290	
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295 300 305	
att cta gac caa gtt gaa gaa aag tta ggc tta aaa cct gaa aag atg	1077
Ile Leu Asp Gln Val Glu Glu Lys Leu Gly Leu Lys Pro Glu Lys Met	
310 315 320	

aag gcc act agg gaa gta ctt agt gaa tat ggt aac atg tca agt gca 1125
 Lys Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn Met Ser Ser Ala
 325 330 335 340

tgt gta ttg ttc atc tta gat gag atg aga aag aaa tcg gca caa gcg 1173
 Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys Ser Ala Gln Ala
 345 350 355

gga ctt aaa acc aca gga gaa ggc ctt gac tgg ggt gtg ttg ttt ggc 1221
 Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly Val Leu Phe Gly
 360 365 370

ttc gga cct gga ctt acc att gaa acc gtt gtt ctc cat agc gtg gct 1269
 Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu His Ser Val Ala
 375 380 385

ata tga aatgattgat tgttttattt tattgtatta cttttaaaact tgcttgaaat 1325
 Ile
 390

tccatgtaag aataaaataca gagttcatgt accatggatg ttaaaacgaa tataaccattt 1385

gtagcttctt ctttttctcg caaaaaaaaaa aggaattc 1423

<210> 9

<211> 389

<212> PRT

<213> Medicago sativa

<400> 9

Met Val Ser Val Ser Glu Ile Arg Gln Ala Gln Arg Ala Glu Gly Pro
 1 5 10 15
 Ala Thr Ile Met Ala Ile Gly Thr Ala Asn Pro Ser Asn Cys Val Glu
 20 25 30
 Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His
 35 40 45
 Lys Val Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met
 50 55 60
 Ile Lys Arg Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn
 65 70 75 80
 Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp
 85 90 95
 Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys
 100 105 110
 Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile
 115 120 125
 Phe Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu


```

tgttttaatc ttgccgttaa agacataata attatactat aaatacaggg agaggctgtg 420
caagattgga gagagattgt aacgtatttc tcgtacccgg tgagaaacag agactactca 480
cggtaggcaa ataagcctga aggatgggtg aaagtgaagg aggagtatag tgagaggctt 540
atgagtttgg cttgtaagct tcttgagggt ttgtctgaag ctatgggtct tgagaaagag 600
tctcttacca atgcatgcgt cgatatggac caaaagattg ttgttaatta ttacccaaaa 660
tgccctcagc ctgatctcac cctcggactc aagcgtcaca ctgaccctgg aaccattacc 720
ttgctgctac aagaccaagt cggtaggatta caagccacac gtgacaatgg caagacctgg 780
attacggttc agcctgttga aggagcgttt gtcgtcaatc tcggcgacca cggtcatgtt 840
agtactctat ccattttattg gcttttttgt ttctctgttt ttgggttttga cttgggtcaac 900
cttgatttgt cttgatgaag tttttgagca atgggagggt caagaatgct gatcatcagg 960
ccgtggtgaa ctctaactcg agcagattat ccatagccac gttccagaac cccgcgccgg 1020
atgccacagt gtatccactg aaagtaagag aaggagagaa ggcaatattg gaggagccaa 1080
tcacgtttgc cgagatgtat aagagaaaga tgggaagaga tttggagctt gctcgacctca 1140
agaagctggc taaagaggag cgtgaccaca aagaagttgc caagcctgtc gaccaaactct 1200
tcgcttagaa tctctgtgtt cttgcttact tgttgttgcg tt 1242

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<210> 11
 <211> 342
 <212> PRT
 <213> *Oryza sativa*

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<400> 11
Met Ala Ala Glu Ala Glu Gln Gln His Gln Leu Leu Ser Thr Ala Val
  1              5              10             15
His Asp Thr Met Pro Gly Lys Tyr Val Arg Pro Glu Ser Gln Arg Pro
      20              25             30
Arg Leu Asp Leu Val Val Ser Asp Ala Arg Ile Pro Val Val Asp Leu
      35              40             45
Ala Ser Pro Asp Arg Ala Ala Val Val Ser Ala Val Gly Asp Ala Cys
      50              55             60
Arg Thr His Gly Phe Phe Gln Val Val Asn His Gly Ile Asp Ala Ala
      65              70             75             80
Leu Ile Ala Ser Val Met Glu Val Gly Arg Glu Phe Phe Arg Leu Pro
      85              90             95
Ala Glu Glu Lys Ala Lys Leu Tyr Ser Asp Asp Pro Ala Lys Lys Ile
      100             105            110
Arg Leu Ser Thr Ser Phe Asn Val Arg Lys Glu Thr Val His Asn Trp
      115             120            125
Arg Asp Tyr Leu Arg Leu His Cys Tyr Pro Leu His Gln Phe Val Pro

```

130	135	140
Asp Trp Pro Ser Asn Pro Pro Ser Phe Lys Glu Ile Ile Gly Thr Tyr		
145	150	155 160
Cys Thr Glu Val Arg Glu Leu Gly Phe Arg Leu Tyr Glu Ala Ile Ser		
	165	170 175
Glu Ser Leu Gly Leu Glu Gly Gly Tyr Met Arg Glu Thr Leu Gly Glu		
	180	185 190
Gln Glu Gln His Met Ala Val Asn Tyr Tyr Pro Gln Cys Pro Glu Pro		
	195	200 205
Glu Leu Thr Tyr Gly Leu Pro Ala His Thr Asp Pro Asn Ala Leu Thr		
	210	215 220
Ile Leu Leu Met Asp Asp Gln Val Ala Gly Leu Gln Val Leu Asn Asp		
225	230	235 240
Gly Lys Trp Ile Ala Val Asn Pro Gln Pro Gly Ala Leu Val Ile Asn		
	245	250 255
Ile Gly Asp Gln Leu Gln Ala Leu Ser Asn Gly Lys Tyr Arg Ser Val		
	260	265 270
Trp His Arg Ala Val Val Asn Ser Asp Arg Glu Arg Met Ser Val Ala		
	275	280 285
Ser Phe Leu Cys Pro Cys Asn Ser Val Glu Leu Gly Pro Ala Lys Lys		
290	295	300
Leu Ile Thr Asp Asp Ser Pro Ala Val Tyr Arg Asn Tyr Thr Tyr Asp		
305	310	315 320
Glu Tyr Tyr Lys Lys Phe Trp Ser Arg Asn Leu Asp Gln Glu His Cys		
	325	330 335
Leu Glu Leu Phe Arg Thr		
	340	

<210> 12

<211> 815

<212> DNA

<213> Juglans nigra

<400> 12


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gaggatgaga gacccaaggt tgcttacaat caattcagca ctgaaatccc catcatctcg 60
cttgccggga tagacgaagt ccatggccgg aggaccgaga tttgccagaa aatcgtcgag 120
gcctgtgagg actggggtat tttccagggt gtcgatcatg gcgtcgatgc cagtctaata 180
tccgacatga cacgtcttgc ccgtgacttc ttcgccatgc ctcccaggga aaagcttcgt 240
ttcgacatgt ccggcggcaa gaagggcggg ttcattgtct ccagccatct gcaaggagaa 300
gcagtgaag attggcgtga aattgtgaca tattttctcat acccaattag gaccagagac 360
tattcgaggt ggccggacaa gccagaaggg tggagaaagg tgacggagga gtacagtga 420
aaattgatgg gactggcatg caaactgttg gaagtgtat cggaggcgat gggattagag 480
aaggaagcat tgaccaaggc ttgcgtggat atggaccaa aggttgtggg taattactat 540
ccaaaatgtc cacagccaga cctcacattg gggctaaagc gccacacaga tcctggcacc 600
atcactctgt tgttcagga ccagggtggg gggcttcagg ccaccagga tggcggcaag 660
acctggatca ctgttcagcc tgttgaagga gctttcgctg tcaatcttgg agaccatggg 720
cattttctga gtaacgggag gttcaagaac gctgatcacc aagcagtggg gaactcaaac 780
tacagtcgat tgtccatgc caccttccaa aaccc 815

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<210> 13

<211> 815

<212> DNA

<213> *Juglans nigra*

<220>

<221> CDS

<222> (1)..(813)

<400> 13

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gag gat gag aga ccc aag gtt gct tac aat caa ttc agc act gaa atc 48
Glu Asp Glu Arg Pro Lys Val Ala Tyr Asn Gln Phe Ser Thr Glu Ile
1 5 10 15

```

```

ccc atc atc tcg ctt gcc ggg ata gac gaa gtc cat ggc cgg agg acc 96
Pro Ile Ile Ser Leu Ala Gly Ile Asp Glu Val His Gly Arg Arg Thr
20 25 30

```

```

gag att tgc cag aaa atc gtc gag gcc tgt gag gac tgg ggt att ttc 144
Glu Ile Cys Gln Lys Ile Val Glu Ala Cys Glu Asp Trp Gly Ile Phe
35 40 45

```

```

cag gtg gtc gat cat ggc gtc gat gcc agt cta atc tcc gac atg aca 192
Gln Val Val Asp His Gly Val Asp Ala Ser Leu Ile Ser Asp Met Thr
50 55 60

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```

cgt ctt gcc cgt gac ttc ttc gcc atg cct ccc gag gaa aag ctt cgt 240
Arg Leu Ala Arg Asp Phe Phe Ala Met Pro Pro Glu Glu Lys Leu Arg
65 70 75 80

```

```

ttc gac atg tcc ggc ggc aag aag ggc ggt ttc att gtc tcc agc cat 288
Phe Asp Met Ser Gly Gly Lys Lys Gly Gly Phe Ile Val Ser Ser His

```

85								90				95				
ctg	caa	gga	gaa	gca	gtg	caa	gat	tgg	cgt	gaa	att	gtg	aca	tat	ttc	336
Leu	Gln	Gly	Glu	Ala	Val	Gln	Asp	Trp	Arg	Glu	Ile	Val	Thr	Tyr	Phe	
			100							105				110		
tca	tac	cca	att	agg	acc	aga	gac	tat	tcg	agg	tgg	ccg	gac	aag	cca	384
Ser	Tyr	Pro	Ile	Arg	Thr	Arg	Asp	Tyr	Ser	Arg	Trp	Pro	Asp	Lys	Pro	
			115				120						125			
gaa	ggg	tgg	aga	aag	gtg	acg	gag	gag	tac	agt	gac	aaa	ttg	atg	gga	432
Glu	Gly	Trp	Arg	Lys	Val	Thr	Glu	Glu	Tyr	Ser	Asp	Lys	Leu	Met	Gly	
			130			135					140					
ctg	gca	tgc	aaa	ctg	ttg	gaa	gtg	cta	tcg	gag	gcg	atg	gga	tta	gag	480
Leu	Ala	Cys	Lys	Leu	Leu	Glu	Val	Leu	Ser	Glu	Ala	Met	Gly	Leu	Glu	
			145			150				155				160		
aag	gaa	gca	ttg	acc	aag	gct	tgc	gtg	gat	atg	gac	caa	aag	gtt	gtg	528
Lys	Glu	Ala	Leu	Thr	Lys	Ala	Cys	Val	Asp	Met	Asp	Gln	Lys	Val	Val	
				165						170				175		
gtt	aat	tac	tat	cca	aaa	tgt	cca	cag	cca	gac	ctc	aca	ttg	ggg	cta	576
Val	Asn	Tyr	Tyr	Pro	Lys	Cys	Pro	Gln	Pro	Asp	Leu	Thr	Leu	Gly	Leu	
			180							185				190		
aag	cgc	cac	aca	gat	cct	ggc	acc	atc	act	ctg	ttg	ttg	cag	gac	cag	624
Lys	Arg	His	Thr	Asp	Pro	Gly	Thr	Ile	Thr	Leu	Leu	Leu	Gln	Asp	Gln	
			195				200						205			
gtg	ggg	ggg	ctt	cag	gcc	acc	agg	gat	ggc	ggc	aag	acc	tgg	atc	act	672
Val	Gly	Gly	Leu	Gln	Ala	Thr	Arg	Asp	Gly	Gly	Lys	Thr	Trp	Ile	Thr	
			210			215					220					
gtt	cag	cct	gtt	gaa	gga	gct	ttc	gtc	gtc	aat	ctt	gga	gac	cat	ggg	720
Val	Gln	Pro	Val	Glu	Gly	Ala	Phe	Val	Val	Asn	Leu	Gly	Asp	His	Gly	
			225			230				235				240		
cat	ttt	ctg	agt	aac	ggg	agg	ttc	aag	aac	gct	gat	cac	caa	gca	gtg	768
His	Phe	Leu	Ser	Asn	Gly	Arg	Phe	Lys	Asn	Ala	Asp	His	Gln	Ala	Val	
				245						250				255		
gtg	aac	tca	aac	tac	agt	cga	ttg	tcc	atc	gcc	acc	ttc	caa	aac	cc	815
Val	Asn	Ser	Asn	Tyr	Ser	Arg	Leu	Ser	Ile	Ala	Thr	Phe	Gln	Asn		
				260			265						270			

<211> 271

<212> PRT

<213> Juglans nigra

<400> 14

Glu Asp Glu Arg Pro Lys Val Ala Tyr Asn Gln Phe Ser Thr Glu Ile
1 5 10 15

Pro Ile Ile Ser Leu Ala Gly Ile Asp Glu Val His Gly Arg Arg Thr
20 25 30

Glu Ile Cys Gln Lys Ile Val Glu Ala Cys Glu Asp Trp Gly Ile Phe
35 40 45

Gln Val Val Asp His Gly Val Asp Ala Ser Leu Ile Ser Asp Met Thr
50 55 60

Arg Leu Ala Arg Asp Phe Phe Ala Met Pro Pro Glu Glu Lys Leu Arg
65 70 75 80

Phe Asp Met Ser Gly Gly Lys Lys Gly Gly Phe Ile Val Ser Ser His
85 90 95

Leu Gln Gly Glu Ala Val Gln Asp Trp Arg Glu Ile Val Thr Tyr Phe
100 105 110

Ser Tyr Pro Ile Arg Thr Arg Asp Tyr Ser Arg Trp Pro Asp Lys Pro
115 120 125

Glu Gly Trp Arg Lys Val Thr Glu Glu Tyr Ser Asp Lys Leu Met Gly
130 135 140

Leu Ala Cys Lys Leu Leu Glu Val Leu Ser Glu Ala Met Gly Leu Glu
145 150 155 160

Lys Glu Ala Leu Thr Lys Ala Cys Val Asp Met Asp Gln Lys Val Val
165 170 175

Val Asn Tyr Tyr Pro Lys Cys Pro Gln Pro Asp Leu Thr Leu Gly Leu
180 185 190

Lys Arg His Thr Asp Pro Gly Thr Ile Thr Leu Leu Leu Gln Asp Gln
195 200 205

Val Gly Gly Leu Gln Ala Thr Arg Asp Gly Gly Lys Thr Trp Ile Thr
210 215 220

Val Gln Pro Val Glu Gly Ala Phe Val Val Asn Leu Gly Asp His Gly

225					230					235						240
His	Phe	Leu	Ser	Asn	Gly	Arg	Phe	Lys	Asn	Ala	Asp	His	Gln	Ala	Val	
				245					250					255		
Val	Asn	Ser	Asn	Tyr	Ser	Arg	Leu	Ser	Ile	Ala	Thr	Phe	Gln	Asn		
			260					265					270			